

- ☒ fossil energy
- ☐ environmental
- ☒ energy efficiency
- ☐ other

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HOT GAS DESULFURIZATION TECHNOLOGY FOR INCREASED EFFICIENCY

States Impacted:

Connecticut, Florida, Georgia,
Kentucky, Ohio, New
Hampshire, North Carolina,
Nevada, New Jersey,
Oklahoma, Pennsylvania,
Texas, West Virginia

Benefit Areas:

Environmental Quality
Improved

Participants:

Federal Energy Technology
Center; United Catalysts;
Intercat, Inc.; Phillips
Petroleum; M.W. Kellogg;
Tampa Electric Co.; General
Electric; Sierra Pacific

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Description

A key component in the development of environmentally superior, high-efficiency power generation systems is hot gas desulfurization (HGD) technology. In this application, hot fuel-gas derived from coal gasification is cleaned at elevated temperatures, and then used for power generation and/or chemical and fuels production. Inherent in today's HGD systems is the ability to mitigate acid precipitation and protect equipment, while operating more efficiently than cold-gas systems.

Over the last two decades, FETC researchers have worked to develop and test sorbents and transport reactors for HGD systems. In fact, FETC researchers have developed the only sorbent test that was able to meet the qualification criteria necessary for the Tampa Electric Power Company project built as part of DOE's Clean Coal Demonstration Program.

In addition, several patents involving FETC in-house staff have been issued that deal with both sorbents and processes for HGD technology. For example, license has been signed with United Catalyst for the manufacture of a HGD sorbent developed by FETC. FETC researchers have also conducted the only known HGD test of real coal-gas utilizing a transport reactor. In addition, FETC has constructed several unique facilities including a large-scale transport reactor at the Morgantown, WV, site in order to evaluate, develop, and advance the state of HGD technology.

Goals

HGD technology offers: (1) increased power generation efficiency due to the ability to conduct gas cleanup at elevated temperatures which allows better thermal integration with other plant equipment; and (2) the potential to reduce emission of sulfur oxides to below 1/10 NSPS (New Source Performance Standards).

Tangible Benefits

National: The U.S. has become the worldwide leader in the development of HGD technology. Concerns over the conservation of natural resources are lessened and greenhouse gas emissions from fossil fuel power plants are minimized as a result of the improvements made to HGD technology.

Regional: The sorbents used to conduct HGD are currently being developed by several companies across the U.S. including Intercat Inc., Phillips Petroleum, and United Catalysts, which produce at facilities located in Georgia, Oklahoma, and Kentucky respectively. HGD process and system development is being conducted by M.W. Kellogg in Texas. To demonstrate HGD to the utility industry, two electric power plants were built as part of DOE's Clean Coal Demonstration Program: the Tampa Electric Company built an integrated gasification combined cycle (IGCC) power plant in Florida that incorporated HGD technology developed by General Electric. In addition, M.W. Kellogg designed a transport HGD system that was built by Sierra Pacific for integration with its Pinon Pine power plant in Nevada.